CLAIMS:

1. Noise suppression apparatus comprising:

means (14) for deriving a reference noise signal (N_{CM}) representing noise in a selected portion of a frequency spectrum of an input signal (S),

first analog-to-digital conversion means (24) for sampling the input signal at a first sampling frequency (F_s) to produce a digital signal (D_j+N_j),

second analog-to-digital conversion means (32) for sampling the reference noise signal (N_{CM}) at a lower sampling frequency (F_s/M) to provide a digital reference noise signal (X_j) having a sample rate lower than a sample rate of the digital signal,

decimation means (40) for decimating the digital signal (D_j+N_j) to produce a decimated signal (D_j+N_j) having the same sample rate as the digital reference noise signal (X_j),

adaptive filter means (34) having adjustable coefficients (W) for filtering the digital reference noise signal (X_j) to provide a noise estimate signal (Y'_j),

means (38) for subtracting the noise estimate signal (Y'_j) from the decimated digital signal (D_j+N_j) to provide an error signal (ϵ_j), the adaptive filter means (34) using the error signal (ϵ_j) to adjust the coefficients of the adaptive filter for the next sample,

interpolation means (46) for upsampling and interpolating the noise estimate signal (Y'_j) to restore the noise estimate signal to the same sample rate as the digital signal (D_j+N_j),

means (18) for subtracting the restored noise estimate signal (Y_j) from the digital signal (D_j+N_j) to provide a noise-suppressed output signal (D_{OUT}), and

delay means (26) for synchronizing the digital signal and the restored noise estimate signal as applied to the second subtracting means.

2. Apparatus according to claim 1, wherein the decimation ratio is equal to the ratio between the first and second sampling frequencies.

3. Apparatus according to claim 1, wherein the means for deriving a reference noise signal comprises a hybrid device for extracting a common mode reference noise signal from a communications channel.

4. Apparatus according to claim 2, wherein the means for deriving a reference noise signal comprises a hybrid device for extracting a common mode reference noise signal from a communications channel.

5. A method of suppressing noise in an input signal comprising the steps of:

(i) deriving a reference noise signal representing noise in a selected portion of a frequency spectrum of the input signal,

(ii) converting the input signal to a digital signal by sampling the input signal at a first sampling rate (F_s),

(iii) sampling the reference noise signal at a lower sampling frequency (F_s/M) to provide a digital reference noise signal that having a sample rate lower than a sample rate of the digital signal,

(iv) decimating the digital signal to produce a decimated signal having the same sample rate as the digital reference noise signal,

(v) using an adaptive filter means having adjustable coefficients, filtering the digital reference noise signal to provide a noise estimate signal,

(vi) subtracting the noise estimate signal from the decimated signal to provide an error signal,

(vii) using the error signal to adjust the coefficients of the adaptive filter for a next sample,

(viii) upsampling and interpolating the noise estimate signal to restore the noise estimate signal to the same sample rate as the digital signal,

(ix) synchronizing the digital signal and the restored noise estimate signal, and

(x) subtracting the restored noise estimate signal from the digital signal to provide a noise-suppressed output signal.

6. A method according to claim 5, wherein the decimation ratio is equal to the ratio between the first and second sampling frequencies.

7. A method according to claim 5, wherein the step of deriving a reference noise signal uses a hybrid device to extract a common mode reference noise signal from a communications channel.

8. A method according to claim 6, wherein the step of deriving a reference noise signal uses a hybrid device to extract a common mode reference noise signal from a communications channel.

9. Noise suppression apparatus comprising:

means (14) for deriving a reference noise signal (N_{CM}) representing noise in a selected portion of a frequency spectrum of an input signal (S),

first analog-to-digital conversion means (24) for sampling the input signal at a first sampling frequency (F_s) to produce a digital signal (D_j+N_j),

second analog-to-digital conversion means (32) for sampling the reference noise signal (N_{CM}) at a lower sampling frequency (F_s/M) to provide a digital reference noise signal (X_j) having a sample rate lower than a sample rate of the digital signal,

interpolation means (46) for upsampling and interpolating the digital reference noise signal (Y'_j) to the same sample rate as the digital signal ($D'_j+N'_j$),

adaptive filter means (34) having adjustable coefficients (W) for filtering the interpolated digital reference noise signal (X_j) to provide a noise estimate signal (Y_j), and

means (18) for subtracting the noise estimate signal (Y_j) from the digital signal (D_j+N_j) to provide a noise-suppressed output signal (D_{OUT}), and supplying the noise-suppressed output signal (D_{OUT}) to the adaptive filter for use in updating weighting coefficients thereof for use with the next sample.

10. A method of suppressing noise in an input signal comprising the steps of:

(i) deriving a reference noise signal representing noise in a selected portion of a frequency spectrum of the input signal,

(ii) converting the input signal to a digital signal by sampling the input signal at a first sampling frequency (F_s),

(iii) sampling the reference noise signal at a lower sampling frequency (F_s/M) to provide a digital reference noise signal having a sample rate lower than a symbol rate of the digital signal,

(iv) upsampling and interpolating the noise estimate signal to the same sampling rate as the digital signal,

(v) using an adaptive filter means having adjustable coefficients, filtering the interpolated digital reference noise signal to provide a noise estimate signal,

(vi) subtracting the noise estimate signal from the decimated signal to provide a noise-suppressed signal, and

(vii) using the noise-suppressed signal to adjust the coefficients of the adaptive filter for the next sample.